

**REMARKS**

Review and reconsideration on the merits are requested.

Claim 37 was rejected under 35 U.S.C. § 102(b) as being anticipated by GB 2311377 (GB '377). The Examiner cited Fig. 1 of GB '377 as meeting each of the terms of rejected claim 37, further noting Fig. 10 of the present specification.

In response, claim 37 has been amended to recite that the area of the negative electrode and the area of the positive electrode differ by at least twofold. This feature of amended claim 37 is not disclosed by GB '377, and withdrawal of the foregoing rejection is respectfully requested.

Claims 16-20, 22-24 and 30-35 were rejected under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent 5,672,811 to Kato et al in view of U.S. Patent 5,676,811 to Makino et al.

Fig. 2 of Kato '811 was cited as showing electrode 28 having a side edge longer than twice that of electrode 24. The Examiner relied on Fig. 2 of Makino et al as showing that it was known in the art to extend the electrodes of the gas sensor over the entire width range of a given chamber (citing electrode 8 and reference electrode 13). The reason for rejection was that it would have been obvious to extend electrodes 28 and 24 over the entire width of the respective chambers as taught by Makino et al, in order to (i) provide maximum surface area and thereby reduce effective resistance, (ii) increase the magnitude of diffusion control, (iii) allow more sample to be analyzed per unit time, and (iv) prevent localization of NO<sub>x</sub> concentration.

Applicants respectfully traverse for the following reasons.

In Fig. 2 of Makino et al, electrodes 7 and 8 together with substrate 35 form pump cell 2, whereas electrodes 12 and 13 in chambers 17 and 19, respectively, form oxygen sensor portion 3. Namely, electrodes 7 and 8 of Makino et al correspond to the claimed negative and positive electrodes. See, for example, present claim 30, wherein the negative and positive electrodes are arranged so as to pump oxygen from the negative electrode to the positive electrode, the sensor comprising a circuit for applying an electric potential between the negative and positive electrodes such that a pump current flows therebetween when the sensor is used for detecting the amount of a gas.

The present claims further require that the negative and positive electrodes are disposed on the same side of a solid electrolyte substrate, but this characteristic feature of the present invention is neither disclosed nor illustrated in any of Figs. 1-23 of Makino et al. That is, electrodes 7 and 8 of Makino et al are disposed on opposite sides of solid electrolyte sheet 35. Also, the Figures of Makino et al show electrodes 7 and 8 as having the same area.

On the other hand, electrodes 12 and 13 forming oxygen sensor portion 3 in Makino et al do not correspond to the negative electrode and positive electrode as claimed in the present application. Even if the Examiner did consider electrodes 12 and 13 forming oxygen sensor portion 3 in Makino et al to correspond to the claimed negative and positive electrodes, electrodes 12 and 13 are of the same area.

Fig. 2 of Kato '811 similarly differs from Makino et al in that electrode 28 relied upon as having a side edge longer than twice that of electrode 24, and corresponding to the claimed negative and positive electrodes, respectively, are arranged on the same side of the support. It is

therefore respectfully submitted that there is nothing in the cited prior art which would lead one of ordinary skill to modify the electrode configuration of Kato '811 so as to extend over the entire width range of a given chamber due to the above-noted differences in configuration and arrangement. More particularly, because the structure of the sensor of Makino et al so much differs from that of Kato '811, the considerations for arranging the electrodes in Makino et al do not apply to Kato '811. Surely, Makino et al is silent with respect to relative electrode area, and has no explanation as to why the electrodes shown therein should extend over the entire width of their respective chambers.

Applicants further comment on patentability of the present claims as follows.

In Figs. 1 and 2 of Kato '811, measurement gas is introduced into first internal space 6 through passage 12. Second internal space 8 communicates with first internal space 6 via second diffusion controlling passage 14. Thus, it makes sense to arrange electrode 28 along the axis of the gas flow. On the other hand, measurement gas in Makino et al is introduced into chamber 17 via communication hole 9, and air passage 19 serves as an oxygen reference (through opening 20). Unlike Kato '811, Makino et al does not have a two-chamber structure including flow of measurement gas from a first chamber to a second chamber. Namely, there is no "gas flow" as in the sensor of Kato '811, such that there is no reason to arrange an electrode along the axis of gas flow as suggested for the case of Kato '811.

Regarding this last point, assuming *arguendo* that one of ordinary skill would find sufficient reason to arrange an electrode along the axis of gas flow, the combination of Kato '811 and Makino et al still does not teach the desirability, and hence the unobviousness, of adjusting

the area of the negative electrode and the area of the positive electrode such that they differ by at least twofold. Moreover, although Makino et al shows the electrodes extending over the entire width of the respective chambers, there is no disclosure in Makino et al as to why such electrode arrangement would be advantageous. The reasons (i) to (iv) above advanced by the Examiner are speculative and nowhere found in the prior art. Applicants therefore dispute that reasons (i) to (iv) constitute knowledge generally available to one of ordinary skill in the art (so as to allow for combination and/or modification of the cited references). Furthermore, the combination of Kato '811 and Makino et al still does not teach or suggest all of the limitations of the rejected claims, including the requirement that the area of the negative electrode and the area of the positive electrode differ by at least twofold. Particularly, the Examiner is taking a drawing from Makino et al, showing electrodes extending over the entire width of the chamber, and reasons that it would likewise have been obvious to extend the electrodes of Kato '811 over the entire width of the chamber. However, there is nothing in the cited prior art as to why it is desirable to employ such an electrode arrangement, or why such electrode arrangement should be applied to the sensor of Kato '811 having a two-chamber structure entirely different from that of the sensor of Makino et al. By applying Makino et al to Kato '811, the Examiner arrives at a modified sensor said to inherently have an area of the negative electrode and area of the positive electrode differing by at least twofold. However, does this truly teach the subject limitation of the present claims, or the advantages thereof? Could one of ordinary skill ever arrive at such an arrangement in the absence of Applicants' teachings in the specification, namely, reduced resistance when the area ratio is set as defined by the present Applicants?

For the above reasons, it is respectfully submitted that the present claims are patentable over Kato '811 in view of Makino et al and withdrawal of the foregoing rejection is respectfully requested.

Claims 16-20, 22-24 and 30-35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 10-38845 or U.S. Patent 6,036,841 to Kato et al in view of Makino et al. As above, the reason for rejection was that it would have been obvious to apply Makino et al (which is said to teach that it is known to extend electrodes over the entire width of their respective chambers) to the sensors of either JP '845 or Kato '841.

Applicants rely on the response above with respect to the rejection over Kato '811 in view of Makino et al.

Withdrawal of all rejections and allowance of claims 16-20, 22-24 and 30-37 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

AMENDMENT UNDER 37 C.F.R. § 1.111  
U.S. Application No. 09/313,184

Q54404

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Respectfully submitted,



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